

ABSTRACT OF THE DISCLOSURE

A neutral beam processing apparatus and method uses a neutral beam having an enlarged diameter and an increased capacity with suppressed divergence. The charged particles of the neutral beam are removed and the variations in energy are reduced. In particular, an ion beam is led from a plasma production cell and neutralized in a neutralization cell to be converted to a neutral beam, and an object to be processed is disposed in a process cell that is irradiated with the neutral beam. A multi-aperture electrode and a permanent magnet line are used for separating charged particles from the neutral beam. By an interaction between an electron cyclotron magnetic field generated by the permanent magnet line and microwaves introduced from a waveguide, a plasma and a flat space potential is generated in the neutralization cell. The neutral beam is obtained by converting the ion beam in the flat space potential.